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(21) Application number: **08348254**(22) Date of filing: **26.12.96**(71) Applicant: **HITACHI CONSTR MACH CO LTD**

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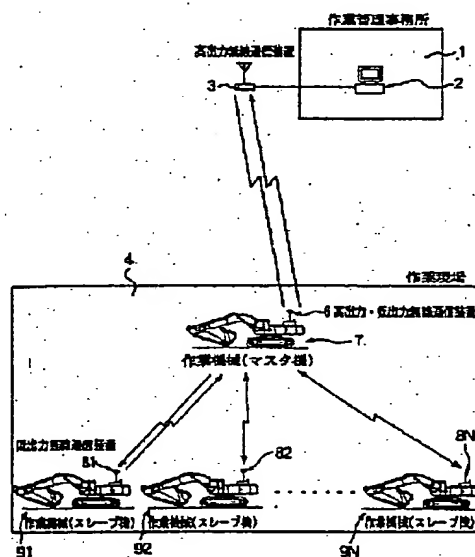
(54) REMOTE MONITORING DEVICE FOR WORKING MACHINE**(57) Abstract:**

PROBLEM TO BE SOLVED: To provided a remote monitoring device for a plurality of working machines in which a large number of inexpensive low output radio communication devices are used.

SOLUTION: The remote monitoring device for working machine comprises a plurality of work machines 7, 91-9N provided with an operation data collecting means which detects the operation condition of working machines in response to a command to output it, and a monitoring device 2 which issues a command to obtain outputs of operation data. In that case a master machine 7 out of the plurality of machines has a high and low output radio communication device 6 and collects the operation data of all of the other working machines 91-9N, being slave machines, through the device 6 to send the work data of all of the machines 7, 91-9N to the monitoring device 1, while the machines 91-9N, slave machines, have low output radio communication means 81-8N respectively to send the work data of each slave machine to the master machine through the low output radio

communication means.

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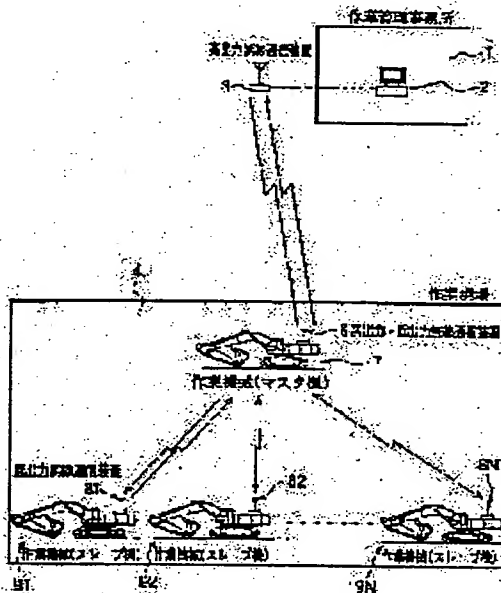
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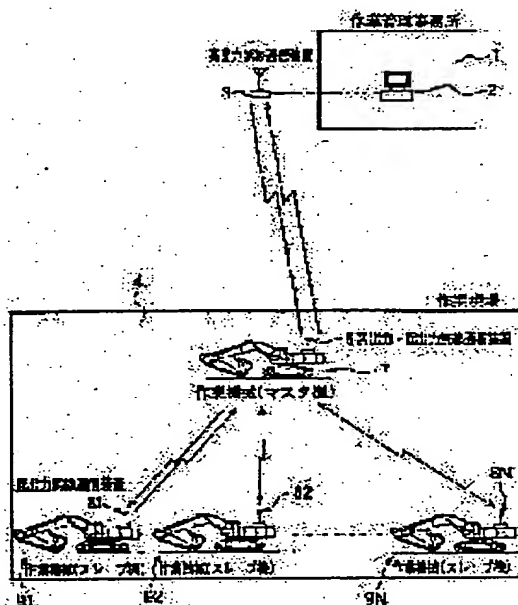
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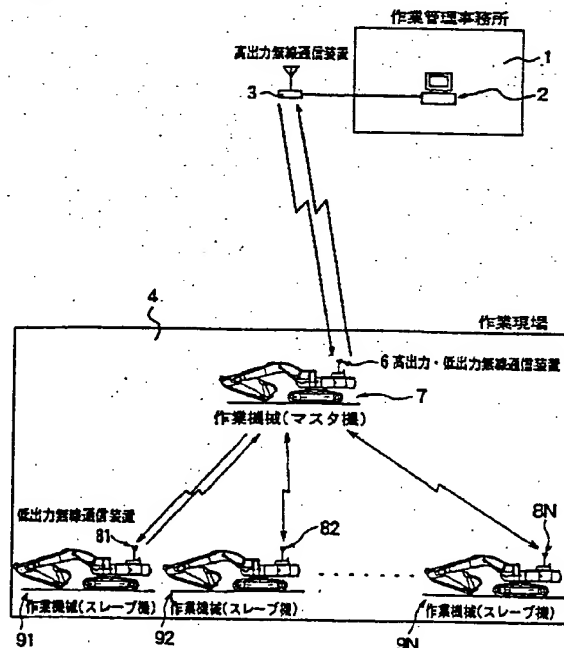
(54) 【発明の名称】 作業機械の遠方監視装置

(57) 【要約】

【課題】 廉価な低出力無線通信装置の使用を多くした複数作業機械の遠方監視装置を提供すること。

【解決手段】 指令に応じて作業機械の稼動状態を検出し出力する稼動データ収集手段を備える複数の作業機械 7、9 1～9 N と、稼動データの出力を指令し、稼動データを入手する監視装置 2 と、から構成される作業機械の遠方監視装置において、複数の作業機械の中の 1 つのマスタ機 7 は、高出力・低出力無線通信装置 6 を備え、高出力・低出力無線通信装置 6 を介して、スレーブ機となる他の全ての作業機械 9 1～9 N の稼動データを収集すると共に、監視装置 1 に全ての作業機械 7、9 1～9 N の稼動データを送信し、スレーブ機となる作業機械 9 1～9 N は低出力無線通信手段 8 1～8 N を備え、低出力無線通信手段を介して、マスタ機に各スレーブ機の稼動データを送信することを特徴とする。

【図 1】



【特許請求の範囲】

【請求項1】 作業機械の稼働状態を検出する検出手段と、指令に応じて前記検出手段から稼働データを検出し出力する稼働データ収集手段と、データを送受信する通信手段と、を備えた複数の作業機械と、データを送受信する通信手段と、前記稼働データ収集手段に対して稼働データの出力を指令し、前記稼働データを入手する稼働データ入手手段と、を備えた監視装置と、

から構成される作業機械の遠方監視装置において、前記複数の作業機械が備えるいずれか1つの通信手段は、高出力および低出力無線通信手段から構成され、該高出力および低出力無線通信手段を備える稼働データ収集手段は、他の全ての作業機械に対して稼働データの収集指令を送信し、各作業機械の稼働データを受信すると共に、前記監視装置に全ての作業機械の稼働データを送信し、前記他の全ての作業機械が備える通信手段は、低出力無線通信手段から構成され、該低出力無線通信手段を備える前記各稼働データ収集手段は、前記高出力および低出力無線通信手段を備える稼働データ収集手段に、作業機械の稼働データを送信することを特徴とする作業機械の遠方監視装置。

【請求項2】 作業機械の稼働状態を検出する検出手段と、指令に応じて前記検出手段から稼働データを検出し出力する稼働データ収集手段と、データを送受信する通信手段と、を備えた複数の作業機械と、データを送受信する通信手段と、前記稼働データ収集手段に対して稼働データの出力を指令し、前記稼働データを入手する稼働データ入手手段と、を備えた監視装置と、

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械の遠方監視装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、作業機械の遠方監視装置に係わり、特にショベル、ブルドーザ、クレーン、ダンプ等の作業機械が複数稼働している状態において、各作業機械の稼働状況を遠方から監視することのできる作業機械の遠方監視装置に関する。

【0002】

10. 【従来の技術】一般に、建設現場や土砂採石現場等では、油圧ショベル、ブルドーザ、クレーン、ダンプ等の作業機械が複数稼働しており、これらの作業機械は一連の流れの中で動いている場合が多い。そのため、1台の作業機械の作業効率が低下したり、また故障により停止すると、その影響は作業管理全体に影響を及ぼし、大きな損害を被る場合がある。これを防ぐためには、作業現場の全ての作業機械の稼働状態ないしは異常状態を常時かつ集中的に管理する必要がある。このような要請に答えるために遠方から作業機械の稼働状態を監視する装置が必要である。

【0003】図7に示す装置は、従来の作業機械を遠方から監視する装置であり、図において、1は作業管理事務所、2はコンピュータを主体とする監視装置、3は作業機械との間でデータの送受信を行う高出力無線通信装置、4は作業現場、51～5Nは油圧ショベル、ブルドーザ、クレーン、ダンプ等の複数の作業機械、61～6Nは監視装置2との間でデータの送受信を行う高出力無線通信装置である。

30. 【0004】このような遠方監視装置において、監視装置2から作業機械51～5Nの稼働データを読み出したという要求は、高出力無線通信装置3から作業機械51～5Nの高出力無線通信装置61～6Nに発せられ、指定された作業機械51は稼働データを測定し、高出力無線通信装置61を介して作業管理事務所1に稼働データを送信する。監視装置2は送信された稼働データを高出力無線通信装置3を介して受信し、各作業機械の稼働状況の確認や故障予測等を行っている。

【0005】

40. 【発明が解決しようとする課題】しかし、通常、作業現場はある程度限られた範囲にあるのに対して、作業管理事務所と作業現場とは離れている場合が多く、また、電波状況の悪いことも予測される。従って、従来技術では、作業管理事務所に設置される監視装置と作業機械間には高出力の無線通信装置を使わざるを得ず、これらの高出力無線通信装置は各作業機械毎に必要となり、装置全体が大きくなり、またコスト高になってしまう。また、監視装置は各作業機械毎にデータの授受を行わなければならない、通信コストが高くなる。従って、本発明では、前記の問題点に鑑み、高出力無線通信装置を減らし、また、監視装置と作業機械間の通信回数を減らした、経済

的な作業機械の遠方監視装置を提供することを目的とするものである。

【0006】

【課題を解決するための手段】前記の目的を達成するために、本発明は、作業機械の稼働状態を検出する検出手段と、指令に応じて前記検出手段から稼働データを検出し出力する稼働データ収集手段と、データを送受信する通信手段と、を備えた複数の作業機械と、データを送受信する通信手段と、前記稼働データ収集手段に対して稼働データの出力を指令し、前記稼働データを入手する稼働データ入手手段と、を備えた監視装置と、から構成される作業機械の遠方監視装置において、前記複数の作業機械が備えるいずれか1つの通信手段は、高出力および低出力無線通信手段から構成され、該高出力および低出力無線通信手段を備える稼働データ収集手段は、他の全ての作業機械に対して稼働データの収集指令を送信し、各作業機械の稼働データを受信すると共に、前記監視装置に全ての作業機械の稼働データを送信し、前記他の全ての作業機械が備える通信手段は、低出力無線通信手段から構成され、該低出力無線通信手段を備える前記各稼働データ収集手段は、前記高出力および低出力無線通信手段を備える稼働データ収集手段に、作業機械の稼働データを送信することを特徴とする。

【0007】また、作業機械の稼働状態を検出する検出手段と、指令に応じて前記検出手段から稼働データを検出し出力する稼働データ収集手段と、データを送受信する通信手段と、を備えた複数の作業機械と、データを送受信する通信手段と、前記稼働データ収集手段に対して稼働データの出力を指令し、前記稼働データを入手する稼働データ入手手段と、を備えた監視装置と、から構成される作業機械の遠方監視装置において、前記複数の作業機械が備えるいずれか1つの通信手段は、高出力および低出力無線通信手段から構成され、該高出力および低出力無線通信手段を備える稼働データ収集手段は、他の作業機械のいずれか一つに対して稼働データの収集指令を送信し、残余の他の作業機械のいずれか一つから全ての他の作業機械の稼働データを受信すると共に、前記監視装置に全ての作業機械の稼働データを送信し、前記他の全ての作業機械が備える通信手段は、低出力無線通信手段から構成され、該低出力無線通信手段を備える各稼働データ収集手段は、前記収集指令に応じて、決められた順番で、自から収集した稼働データと共に、他の稼働データ収集手段から送信される稼働データを、さらに他の稼働データ収集手段に累積して送信し、最後の低出力無線通信手段を備える稼働データ収集手段は、前記高出力および低出力無線通信手段を備える稼働データ収集手段に、全ての他の作業機械の稼働データを送信することと特徴とする。

【0008】

【発明の実施の形態】本発明の第1の実施形態を図1～

図3を用いて説明する。

【0009】図1は本実施形態に係わる、作業機械の遠方監視装置の全体構成図、図2は図1に示すマスタ機となる作業機械に備わる稼働データ収集装置の全体構成図、図3は図1に示すスレーブ機となる作業機械に備わる稼働データ収集装置の全体構成図である。

【0010】これらの図において、6はマスタ機となる作業機械が備える高出力および低出力の通信機能を有する高出力・低出力無線通信装置、7はマスタ機となる作業機械、81～8Nはスレーブ機となる作業機械が備える低出力の通信機能を有する低出力無線通信装置、91～9Nはスレーブ機となる作業機械、10はマスタ機となる作業機械7に備わる稼働データ収集装置、101は通信回路、102は演算処理を行うMPU、103はセンサ検出回路、104は、マスタ機となる作業機械7の稼働データの記憶エリア、1051～105Nはスレーブ機となる作業機械91～9Nの稼働データの記憶エリア、111～11nは作業機械の稼働状態を把握するために作業機械の各部に設けられたセンサ、12はスレーブ機となる作業機械91～9Nに備わる稼働データ収集装置、121は通信回路、122は演算処理を行うMPU、123はセンサ出力検出回路、124は、スレーブ機となる作業機械91～9Nの稼働データの記憶エリア、その他の構成は図7に示されるものと同一であるので説明を省略する。

【0011】次に本実施形態の動作を図1～図3を用いて説明する。

【0012】作業管理事務所1にある監視装置2の高出力無線通信装置3から出力された稼働データ要求信号を、高出力・低出力無線通信装置6を備えるマスタ機となる作業機械7に送信する。

【0013】高出力・低出力無線通信装置6で受信された信号は、稼働データ収集装置10の通信回路101で所定の信号に処理した後、MPU102でデータの解析が行われる。

【0014】MPU102で受信データが正しければ、作業機械7に搭載されている各種のセンサ111～11nから作業機械7の稼働状態をセンサ検出回路103から読み込み、作業機械7の稼働データ記憶エリア104に記憶する。

【0015】次に、MPU102はスレーブ機となる作業機械91～9Nのいずれかの作業機械91に対して、通信回路101、高出力・低出力無線通信装置6を通して稼働データ要求信号を送信する。作業機械91は、低出力無線通信装置81で受信した信号を、稼働データ収集装置12の通信回路121で所定の信号処理後、MPU122でデータの解析を行う。

【0016】MPU122によって、受信データが正しければ、作業機械91に搭載されている各種のセンサ111～11nから作業機械91の稼働状態をセンサ検出

回路123から読み込み、稼働データ記憶エリア124に記憶する。記憶された稼働データは通信回路121、低出力無線通信装置81を通してマスタ機である作業機械7に送信する。

【0017】作業機械7の高出力・低出力無線通信装置6によって受信された稼働データは通信回路101を通し、MPU102によって、所定の稼働データ記憶エリア1051に記憶する。

【0018】同様にして、MPU102は残りの全てのスレーブ機である作業機械92～9Nから稼働データを収集し、稼働データ記憶エリア1052～105Nに記憶する。

【0019】マスタ機である作業機械7の稼働データ記憶エリア1051～105Nに、全てのスレーブ機である作業機械91～9Nの稼働データが記憶された時点で、MPU102は稼働データ記憶エリア104、1051～105Nの全ての稼働データを通信回路101、高出力・低出力無線通信装置6を通して、作業管理事務所1に送信する。

【0020】送信された稼働データは高出力無線通信装置3で受信され、監視装置2に入力され、所定の処理を行うことによって、各作業機械7、91～9Nの稼働状況や故障予測等を行うことができる。

【0021】上記のごとく、本実施形態によれば、高出力無線通信装置は作業管理事務所とマスタ機となる作業機械にのみ設置すればよく、他の作業機械の無線通信装置は低出力の装置で済むので、小型で安価な装置とすることができる。

【0022】また、通信回線に公衆回線を使用する場合は、作業管理事務所とマスタ機となる作業機械間の通信のみを公衆回線を使用し、マスタ機とスレーブ機間には低出力の通信装置を使用することができるので、1台分の回線使用料で複数台分の稼働データを監視することができ、また、一度のアクセスで複数車両の稼働データを監視することができるので監視装置の操作が簡単になる。

【0023】次に、本発明の第2の実施形態について図4～図6を用いて説明する。

【0024】図4は本実施形態に係わる、作業機械の遠方監視装置の全体構成図、図5は図4に示すマスタ機となる作業機械に備わる稼働データ収集装置の全体構成図、図6は図4に示すスレーブ機となる作業機械に備わる稼働データ収集装置の全体構成図である。

【0025】なお、これらの図において、従来技術および第1の実施形態に示される構成と同じ構成については同一符号を付して説明を省略する。

【0026】図6において、1251～125Nは、スレーブ機となる各作業機械91～9Nの稼働データ収集装置12における、各作業機械の稼働データ記憶エリアである。

【0027】次に本実施形態の動作を図4～図6を用いて説明する。

【0028】第1の実施形態と同様に、作業管理事務所1の高出力無線通信装置3から送信された稼働データ要求信号は、マスタ機となる作業機械7に搭載されている高出力・低出力無線通信装置6で受信される。

【0029】受信された信号は、通信回路101を通して、MPU102でデータの解析が行われ、受信データが正しいければ、作業機械7に搭載されている各種のセンサ111～11nから作業機械7の稼働状態を読み込み、作業機械7の稼働データ記憶エリア104に記憶する。次に、MPU102はスレーブ機となる作業機械91～9Nのうちの所定の作業機械91に対して、通信回路101、高出力・低出力無線通信装置6を通して稼働データ要求信号を送信する。

【0030】作業機械91は低出力無線通信装置81で受信した信号を、稼働データ収集装置12の通信回路121で所定の信号処理後、MPU122でデータの解析が行われる。MPU122で受信データが正しいければ、作業機械91に搭載されている各種のセンサ111～11nから作業機械91の稼働状態をセンサ検出回路123から読み込み、稼働データ記憶エリア1251に記憶する。

【0031】次に、記憶された作業機械91の稼働データは、通信回路121、低出力無線通信装置81を通して他の所定のスレーブ機である作業機械92に送信される。

【0032】作業機械92は、低出力無線通信装置82によって受信した稼働データを通信回路121を通して、MPU122によって、所定の稼働データ記憶エリア1251に記憶する。

【0033】次に、MPU122は自らの稼働状態をセンサ111～11nによって検出し、検出された稼働データを稼働データ記憶エリア1252に記憶する。

【0034】次に、MPU122は稼働データ記憶エリア1251～1252に記憶した稼働データを通信回路121、低出力無線通信装置82を通して、次の所定のスレーブ機である作業機械に送信する。

【0035】この様にして順次累積して送信された各作業機械の稼働データは、最後のスレーブ機である作業機械9Nからマスタ機である作業機械7に送信され、送信された作業機械91～9Nの各稼働データは作業機械7の稼働データ記憶エリア1051～105Nに記憶される。

【0036】作業機械7は、MPU102によって稼働データ記憶エリア104、1051～105Nの全ての作業機械の稼働データを、通信回路101、高出力・低出力無線通信装置6を通して、作業管理事務所1に送信する。

【0037】送信された稼働データは高出力無線通信装

置3で受信され、監視装置2に入力され、所定の処理を行うことによって、各作業機械7、91～9Nの稼働状況や故障予測等を行うことができる。

【0038】上記のごとく、本実施形態によれば、第1の実施形態の効果に加えて、マスタ機となる作業機械は、スレーブ機となる作業機械へのアクセスは1回限りであるので、スレーブ機が稼働データを収集している間、マスタ機は他の処理業務を行うことができ、稼働データ収集装置の稼働効率が良くなる。

【0039】

【発明の効果】以上のごとく、本発明は、高出力無線通信装置が作業管理事務所とマスタ機となる作業機械にのみ設置すればよく、他の作業機械には低出力無線通信装置を設置すればよいので、小型で安価な装置とすることができる。

【図面の簡単な説明】

【図1】本発明の第1の実施形態に係わる、作業機械の遠方監視装置の全体構成図である。

【図2】第1の実施形態に係わる、マスタ機となる作業機械に備わる稼働データ収集装置の全体構成図である。

【図3】第1の実施形態に係わる、スレーブ機となる作業機械に備わる稼働データ収集装置の全体構成図であ *

＊る。

【図4】本発明の第2の実施形態に係わる、作業機械の遠方監視装置の全体構成図である。

【図5】第2の実施形態に係わる、マスタ機となる作業機械に備わる稼働データ収集装置の全体構成図である。

【図6】第2の実施形態に係わる、スレーブ機となる作業機械に備わる稼働データ収集装置の全体構成図である。

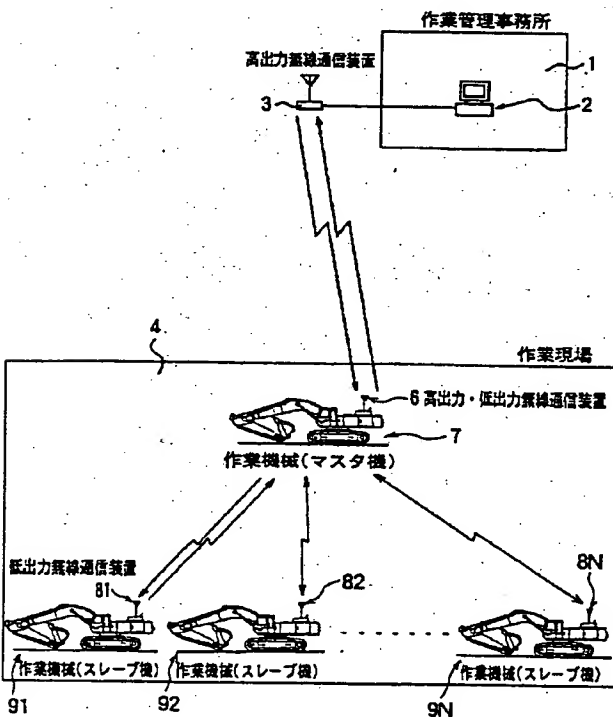
【図7】従来技術に係わる作業機械の遠方監視装置の全体構成図である。

【符号の説明】

- 1 作業管理事務所
- 2 監視装置
- 3 高出力無線通信装置
- 4 作業現場
- 6 高出力・低出力無線通信装置
- 7 マスタ機となる作業機械
- 10、12 稼働データ収集装置
- 81～8N 低出力無線通信装置
- 91～9N スレーブ機となる作業機械
- 111～11n センサ

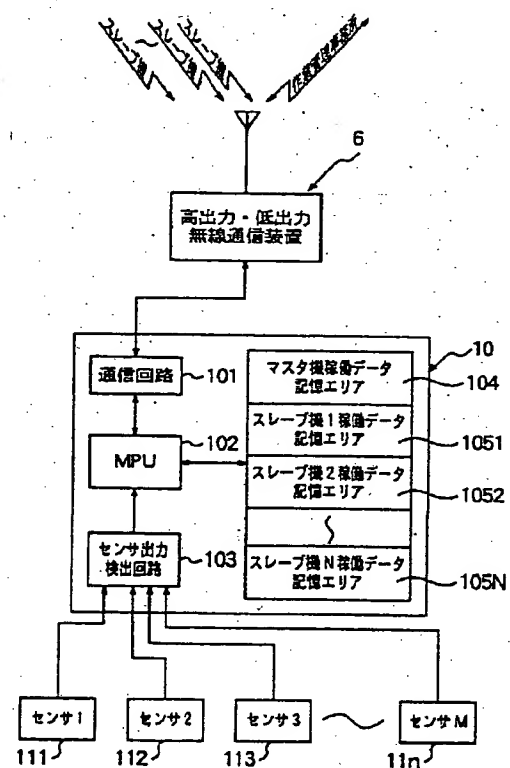
【図1】

【図1】



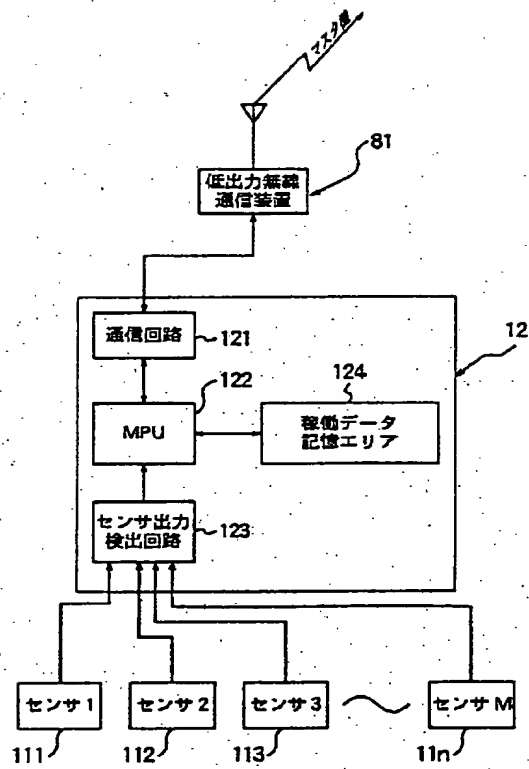
【図2】

【図2】



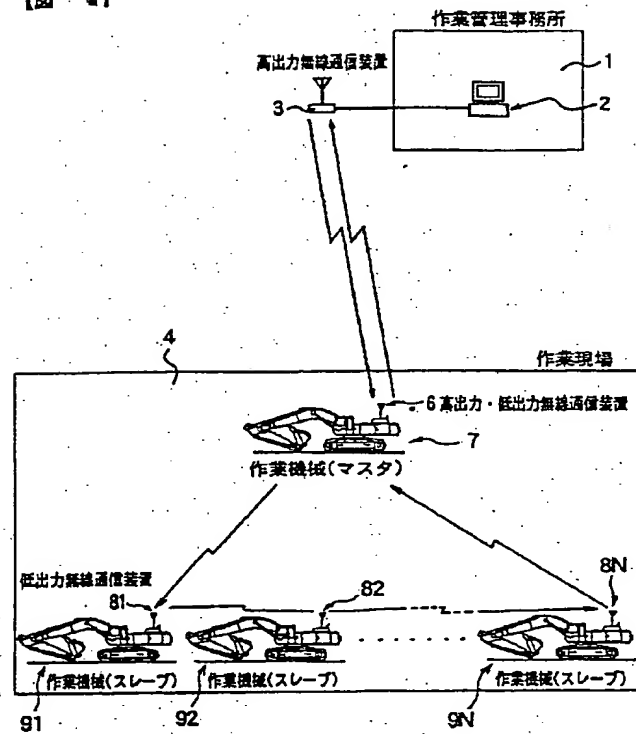
【図3】

【図3】



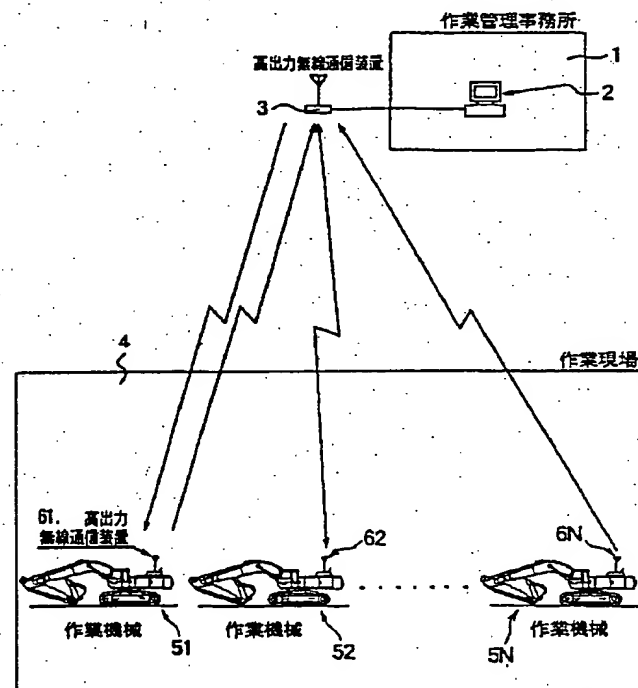
【図4】

【図4】



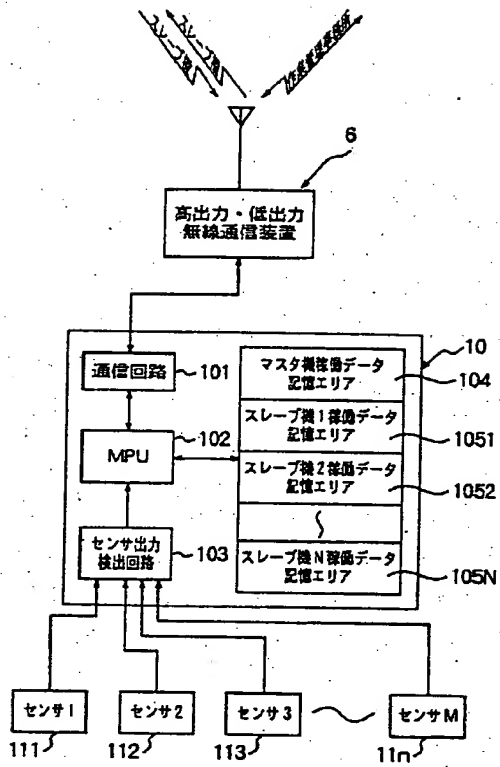
【図7】

【図7】



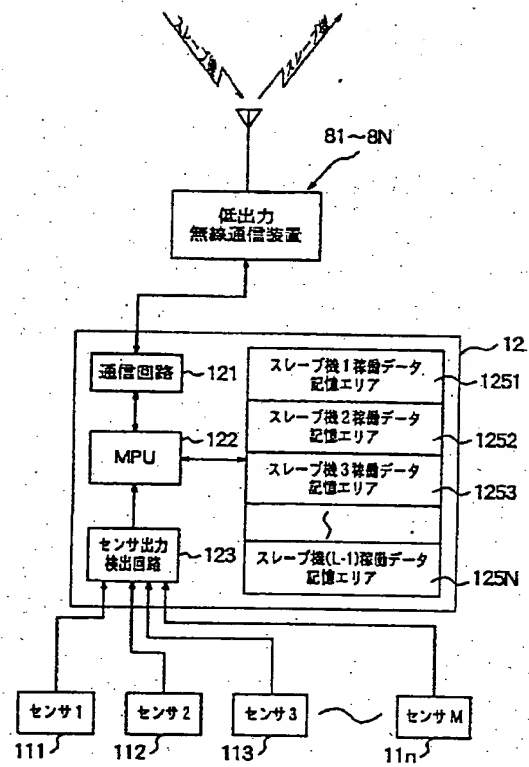
【図5】

【図 5】



【図6】

【図 6】



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Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

Translated: 01:31:32 JST 11/09/2004

Dictionary: Last updated 10/12/2004 / Priority:

CLAIMS

[Claim(s)]

[Claim 1] A detection means to detect the working state of an operating machine, and an operation data collection means to detect and output operation data from said detection means according to instructions, Two or more operating machines equipped with the means of communications which carries out the receive and transmit of the data, and the means of communications which carries out the receive and transmit of the data, In supervisory equipment equipped with an operation data acquisition means by which orders it the output of operation data to said operation data collection means, and said operation data come to hand, and the remote-supervisory equipment of the operating machine ** constituted [any one means of communications with which said two or more operating machines are equipped] [the operation data collection means which consists of high power and a low-power output radio means, and is equipped with this high power and a low-power output radio means] While transmitting collection instructions of operation data to other operating machines of all the and receiving the operation data of each operating machine [the means of communications which transmits the operation data of all the operating machines to said supervisory equipment and with which all the operating machines besides the above are equipped] Said each operation data collection means which consists of low-power output radio means, and is equipped with this low-power output radio means is remote-supervisory equipment of the operating machine characterized by transmitting the operation data of an operating machine to an operation data collection means equipped with said high power and a low-power output radio means.

[Claim 2] A detection means to detect the working state of an operating machine, and an operation data collection means to detect and output operation data from said detection means according to instructions, Two or more operating machines equipped with the means of communications which carries out the receive and transmit of the data, and the means of communications which carries out the receive and transmit of the data, In supervisory equipment equipped with an operation data acquisition means by which orders it the output of operation data to said operation data collection means, and said operation data come to hand, and the remote-supervisory equipment of the operating machine ** constituted [any one means of communications with which said two or more operating machines are equipped] [the operation data collection means which consists of high power and a low-power output radio means, and is equipped with this high power and a low-power output radio means] While transmitting collection instructions of operation data to any one of the operating machines of other and receiving the operation data of all other operating machines from any one of the residual operating machines of other [the means of communications which transmits the operation data of all the operating machines to said supervisory equipment and with which all the operating machines besides the above are equipped] [the operation data

transmitted from other operation data collection means with the operation data which each operation data collection means which consists of low-power output radio means, and is equipped with this low-power output radio means is the turn decided according to said collection instructions, and were collected naturally] The operation data collection means which accumulates and transmits to the operation data collection means of further others, and is equipped with the last low-power output radio means is remote-supervisory equipment of the operating machine by which it is transmitting-to operation data collection means equipped with said high power and low-power output radio means-operation data of all other operating machines characterized.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the remote-supervisory equipment of the operating machine which can supervise the system operating status of each operating machine from a distant place with respect to the remote-supervisory equipment of an operating machine in the state where two or more operating machines, such as a shovel, a bulldozer, a crane, and discharge, are working.

[0002]

[Description of the Prior Art] Generally, two or more operating machines, such as a hydraulic excavator, a bulldozer, a crane, and discharge, are working, and these operating machines are running by the job site or the earth-and-sand quarrying site in a series of flow in many cases. Therefore, if the working efficiency of one set of an operating machine falls and it stops by failure, the effect may affect the whole work management and may suffer serious damage. In order to prevent this, it is necessary to manage always and intensively the working state or abnormal condition of all the operating machines of a work site. In order to reply to such a request, the equipment which supervises the working state of an operating machine from a distant place is required.

[0003] The equipment shown in drawing 7 is equipment which supervises the conventional operating machine from a distant place, and is set to drawing. The supervisory equipment with which 1 considers it as a work management administration building, and 2 makes a computer a subject, the high-output radio communication equipment with which 3 performs the receive and transmit of data between operating machines, It is the high-output radio communication equipment which 4 performs a work site, performs two or more sets of 51-5 Ns of operating machines, such as a hydraulic excavator, a bulldozer, a crane, and discharge, and performs 61-6 Ns of receive and transmits of data between supervisory equipment 2.

[0004] [a demand that he wants to read the operation data of 51-5 Ns of operating machines from supervisory equipment 2] in such remote-supervisory equipment Emitted by 61-6 Ns of high-output radio communication equipments of 51-5 Ns of operating machines from the high-output radio communication equipment 3, the specified operating machine 51 measures operation data, and transmits operation data to the work management administration building 1 through the high-output radio communication equipment 61. Supervisory equipment 2 receives the transmitted operation data through the high-output radio communication equipment 3, and is performing a check, failure prediction, etc. of the operation situation of each operating machine.

[0005]

[Problem to be solved by the invention] However, it is separated from the work site of the work management administration building and the work site to being in the range restricted to some extent in many cases, and the bad thing of an electric-wave situation is also usually predicted. therefore, the radio communication equipment of high power [between / the

supervisory equipment installed in a work management administration building in conventional technology, and an operating machine] -- not using -- it does not obtain, but these high-output radio communication equipments will be needed for every operating machine, and the whole equipment will become large, and it will become a cost overrun. Moreover, supervisory equipment must deliver and receive data for every operating machine, and communication cost becomes high. Therefore, it aims at offering the remote-supervisory equipment of an economical operating machine which reduced the high-output radio communication equipment, and reduced the time communication between supervisory equipment and an operating machine in view of the aforementioned trouble in this invention. [0006]

[Means for solving problem] A detection means by which this invention detects the working state of an operating machine in order to attain the aforementioned object, An operation data collection means to detect and output operation data from said detection means according to instructions, Two or more operating machines equipped with the means of communications which carries out the receive and transmit of the data, and the means of communications which carries out the receive and transmit of the data, In supervisory equipment equipped with an operation data acquisition means by which orders it the output of operation data to said operation data collection means, and said operation data come to hand, and the remote-supervisory equipment of the operating machine ** constituted [any one means of communications with which said two or more operating machines are equipped] [the operation data collection means which consists of high power and a low-power output radio means, and is equipped with this high power and a low-power output radio means] While transmitting collection instructions of operation data to other operating machines of all the and receiving the operation data of each operating machine [the means of communications which transmits the operation data of all the operating machines to said supervisory equipment and with which all the operating machines besides the above are equipped] It consists of low-power output radio means, and said each operation data collection means equipped with this low-power output radio means is characterized by transmitting the operation data of an operating machine to an operation data collection means equipped with said high power and a low-power output radio means.

[0007] Moreover, a detection means to detect the working state of an operating machine and an operation data collection means to detect and output operation data from said detection means according to instructions, Two or more operating machines equipped with the means of communications which carries out the receive and transmit of the data, and the means of communications which carries out the receive and transmit of the data, In supervisory equipment equipped with an operation data acquisition means by which orders it the output of operation data to said operation data collection means, and said operation data come to hand, and the remote-supervisory equipment of the operating machine ** constituted [any one means of communications with which said two or more operating machines are equipped] [the operation data collection means which consists of high power and a low-power output radio means, and is equipped with this high power and a low-power output radio means] While transmitting collection instructions of operation data to any one of the operating machines of other and receiving the operation data of all other operating machines from any one of the residual operating machines of other [the means of communications which transmits the operation data of all the operating machines to said supervisory equipment and with which all the operating machines besides the above are equipped] [the operation data transmitted from other operation data collection means with the operation data which each operation data collection means which consists of low-power output radio means, and is equipped with this low-power output radio means is the turn decided according to said collection instructions, and were collected naturally] It accumulates and transmits to the operation data collection means of further others, and is transmitting-to operation data

collection means equipped with said high power and low-power output radio means-operation data of all other operating machines characterized by an operation data collection means equipped with the last low-power output radio means.

[0008]

[Mode for carrying out the invention] The 1st operation gestalt of this invention is explained using drawing 1 - drawing 3.

[0009] Entire configuration drawing of the remote-supervisory equipment of an operating machine concerning this operation gestalt in drawing 1, entire configuration drawing of the operation data collector with which drawing 2 is equipped in the operating machine with which it becomes the master machine shown in drawing 1, and drawing 3 are entire configuration drawings of the operation data collector with which the operating machine used as the slave machine shown in drawing 1 is equipped.

[0010] The high power and the low-power output radio communication equipment which has the communication facility of the high power with which the operating machine with which 6 becomes a master machine is equipped in these drawings, and low-power output, The low-power output radio communication equipment which has the communication facility of the low-power output with which the operating machine with which 7 becomes a master machine, and the operating machine which serves as a slave machine 81-8 Ns are equipped, The operation data collector with which the operating machine which serves as a slave machine 91-9 Ns, and the operating machine 7 with which 10 becomes a master machine are equipped, MPU to which 101 performs a communication circuit and 102 performs data processing, and 103 [a sensor detector and 104] The storage area of the operation data of the operating machine 7 used as a master machine, the storage area of the operation data of 91-9 Ns of operating machines which serve as a slave machine 1051-105 Ns, The sensor formed in each part of the operating machine in order to grasp 111-11n of operating status of an operating machine, MPU to which the operation data collector equipped with 12 in 91-9 Ns of operating machines used as a slave machine and 121 perform a communication circuit, and 122 performs data processing, and 123 [a sensor output detection circuit and 124.] Since the storage area of the operation data of 91-9 Ns of operating machines used as a slave machine and other composition are the same as that of what is shown in drawing 7, explanation is omitted.

[0011] Next, operation of this operation gestalt is explained using drawing 1 - drawing 3.

[0012] The operation data demand signal outputted from the high-output radio communication equipment 3 of the supervisory equipment 2 in the work management administration building 1 is transmitted to the operating machine 7 used as a master machine equipped with high power and the low-power output radio communication equipment 6.

[0013] After processing the signal received with high power and the low-power output radio communication equipment 6 to a predetermined signal by the communication circuit 101 of the operation data collector 10, analysis of data is conducted by MPU102.

[0014] If received data are right at MPU102, the working state of 111-11n of various kinds of sensors carried in the operating machine 7 to the operating machine 7 will be read from the sensor detector 103, and it will memorize to the operation data storage area 104 of the operating machine 7.

[0015] Next, MPU102 transmits an operation data request signal through the communication circuit 101, and high power and a low-power output radio communication equipment 6 to one operating machine 91 of 91-9 Ns of the operating machines used as a slave machine. The operating machine 91 analyzes data for the signal received with the low-power output radio communication equipment 81 by MPU122 after predetermined signal processing by the communication circuit 121 of the operation data collector 12.

[0016] By MPU122, if received data are right, the working state of 111-11n of various kinds of sensors carried in the operating machine 91 to the operating machine 91 will be read from

the sensor detector 123, and it will memorize to the operation data storage area 124. The memorized operation data are transmitted to the communication circuit 121 and the operating machine 7 which it lets it pass low-power output radio-communication-equipment 81, and is a master machine.

[0017] The operation data received by the high power and the low-power output radio communication equipment 6 of the operating machine 7 memorize the communication circuit 101 to the predetermined operation data storage area 1051 by through and MPU102.

[0018] Similarly, MPU102 collects operation data from 92-9Ns of operating machines which are all the remaining slave machines, and memorizes them to 1052-105 Ns of operation data storage areas.

[0019] When the operation data of 91-9 Ns of operating machines which are all the slave machines are memorized by 1051-105 Ns of operation data storage areas of the operating machine 7 which is a master machine MPU102 lets the communication circuit 101, and high power and a low-power output radio communication equipment 6 pass, and transmits the operation data storage area 104 and all the 1051-105-N operation data to the work management administration building 1.

[0020] It is received by the high-output radio communication equipment 3, the transmitted operation data are inputted into supervisory equipment 2, and each operating machine 7, 91-9-N system operating status, failure prediction, etc. can be performed by performing predetermined processing.

[0021] Since the radio communication equipment of other operating machines can be managed with the equipment of low-power output like the above that what is necessary is to install a high-output radio communication equipment only in the operating machine used as a work management administration building and a master machine according to this operation gestalt, it can be considered as small and cheap equipment.

[0022] When [moreover,] using a public line for a communication line Since a public line can be used only for communication between the operating machines used as a work management administration building and a master machine and the communication device of low-power output can be used between a master machine and a slave machine Since the operation data for two or more sets can be supervised by the connection fees for one set and the operation data of two or more cars can be once supervised by access, operation of supervisory equipment becomes easy.

[0023] Next, the 2nd operation gestalt of this invention is explained using drawing 4 - drawing 6.

[0024] Entire configuration drawing of the remote-supervisory equipment of an operating machine concerning this operation gestalt in drawing 4, entire configuration drawing of the operation data collector with which drawing 5 is equipped in the operating machine with which it becomes the master machine shown in drawing 4, and drawing 6 are entire configuration drawings of the operation data collector with which the operating machine used as the slave machine shown in drawing 4 is equipped.

[0025] In addition, in these drawings, the same sign is attached about the same composition as the composition shown in conventional technology and the 1st operation gestalt, and explanation is omitted.

[0026] In drawing 6, 1251-125 Ns is the operation data storage area of each operating machine in the operation data collector 12 of 91-9 Ns of each operating machine used as a slave machine.

[0027] Next, operation of this operation gestalt is explained using drawing 4 - drawing 6.

[0028] The operation data request signal transmitted from the high-output radio communication equipment 3 of the work management administration building 1 is received like the 1st operation gestalt by the high power and the low-power output radio communication equipment 6 carried in the operating machine 7 used as a master machine.

[0029] It passes along the communication circuit 101 and analysis of data is conducted by MPU102, and if received data are right, the received signal will read the working state of the operating machine 7 from 111-11n of various kinds of sensors carried in the operating machine 7, and will memorize it to the operation data storage area 104 of the operating machine 7. Next, MPU102 transmits an operation data request signal through the communication circuit 101, and high power and a low-power output radio communication equipment 6 to the predetermined operating machine 91 of 91-9 Ns of the operating machines used as a slave machine.

[0030] In the signal which received the operating machine 91 with the low-power output radio communication equipment 81, analysis of data is conducted by MPU122 after predetermined signal processing by the communication circuit 121 of the operation data collector 12. If received data are right at MPU122, the working state of 111-11n of various kinds of sensors carried in the operating machine 91 to the operating machine 91 will be read from the sensor detector 123, and it will memorize to the operation data storage area 1251.

[0031] Next, the operation data of the memorized operating machine 91 are transmitted to the communication circuit 121 and the operating machine 92 which it lets it pass low-power output radio-communication-equipment 81, and are other predetermined slave machines.

[0032] The operating machine 92 lets the communication circuit 121 pass, and memorizes the operation data received with the low-power output radio communication equipment 82 to the predetermined operation data storage area 1251 by MPU122.

[0033] Next, MPU122 detects its working state by 111-11n of sensors, and memorizes the detected operation data to the operation data storage area 1252.

[0034] Next, MPU122 lets the communication circuit 121 and the low-power output radio communication equipment 82 pass, and transmits the operation data memorized to the operation data storage area 1251-1252 to the operating machine which is the following predetermined slave machine.

[0035] Thus, the operation data of each operating machine transmitted by carrying out sequential accumulation are transmitted to the operating machine 7 which is a master machine from 9Ns of operating machines which are the last slave machine, and each transmitted operation data of 91-9 Ns of operating machines is memorized by 1051-105 Ns of operation data storage areas of the operating machine 7.

[0036] By MPU102, the operating machine 7 lets the communication circuit 101, and high power and a low-power output radio communication equipment 6 pass, and transmits the operation data storage area 104 and the operation data of all the 1051-105-N operating machines to the work management administration building 1.

[0037] It is received by the high-output radio communication equipment 3, the transmitted operation data are inputted into supervisory equipment 2, and each operating machine 7, 91-9-N system operating status, failure prediction, etc. can be performed by performing predetermined processing.

[0038] According to this operation gestalt, like the above, in the effectiveness of the 1st operation gestalt [in addition, the operating machine used as a master machine] Since access to the operating machine used as a slave machine is a limitation once, while the slave machine is collecting operation data, the master machine can perform other processing operation and the operation efficiency of an operation data collector becomes good.

[0039]

[Effect of the Invention] Since what is necessary is just to install a low-power output radio communication equipment in other operating machines like the above that what is necessary is to install this invention only in the operating machine with which a high-output radio communication equipment serves as a work management administration building and a master machine, it can be considered as small and cheap equipment.

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